Claims:

1. A pump for feeding a liquid for chromatography, comprising,

first and second chambers,

first and second plungers forming first and second volumes respectively together with the first and second chambers and being capable of reciprocating in the first and second chambers respectively in such a manner that the first and second volumes are variable in accordance with respective movements of the first and second plungers,

a communication path connecting fluidly the first and second volumes to each other,

an inlet path communicating fluidly with the first volume, from which inlet path the liquid to be fed is capable of being supplied into the first volume, and

an outlet path communicating fluidly with the second volume, by which outlet path the liquid to be fed is capable of being discharged from the second volume,

wherein the first plunger is prevented from changing the first volume sufficiently for feeding the liquid between the first volume and the second volume when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography.

2. A pump according to claim 1, wherein the

first plunger is prevented from changing the first volume sufficiently for changing a pressure of the liquid in the second volume through the communication path when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography.

3. A pump according to claim 1, wherein the communication path connects fluidly the first and second volumes to each other in series so that the liquid to be fed for the chromatography is capable of being fed from the first volume through the communication path to the second volume, the communication path includes a check valve for allowing the liquid to flow from the first volume into the second volume when a pressure in the first volume is higher than a pressure in the second volume and preventing the liquid from flowing from the second volume into the first volume when the pressure in the first volume is not higher than the pressure in the second volume.

4. A pump according to claim 3, wherein the check valve is capable of allowing the liquid to flow from the first volume into the second volume when the pressure in the first volume is higher than the pressure in the second volume and a difference in absolute value between the pressure in the first volume and the pressure in the second volume is more than a predetermined value more than zero, and of preventing the liquid from flowing from the first volume into the

second volume when the pressure in the first volume is not higher than a total amount of the pressure in the second volume and the predetermined value.

5. A pump according to claim 4, wherein the first plunger is prevented from decreasing the first volume sufficiently for increasing the pressure of the liquid in the first volume to more than the total amount of the pressure in the second volume and the predetermined value when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography.

6. A pump according to claim 5, wherein when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography, the first plunger is capable of decreasing the first volume to increase the pressure of the liquid in the first volume to more than a pressure in the inlet path and is prevented from decreasing the first volume sufficiently for increasing the pressure of the liquid in the first volume to more than the total amount of the pressure in the second volume and the predetermined value.

7. A pump according to claim 6, wherein when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography, the first plunger is capable of decreasing the first volume to increase the pressure of

the liquid in the first volume to more than the pressure in the second volume and is prevented from decreasing the first volume sufficiently for increasing the pressure of the liquid in the first volume to more than the total amount of the pressure in the second volume and the predetermined value.

8. A pump according to claim 3, wherein when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography, the first plunger is capable of decreasing the first volume to increase the pressure of the liquid in the first volume to more than a pressure in the inlet path and is prevented from decreasing the first volume sufficiently for increasing the pressure of the liquid in the first volume to more than the pressure in the second chamber.

9. A pump according to claim 8, wherein the check valve is capable of allowing the liquid to flow from the first volume into the second volume when the pressure in the first volume is more than the pressure in the second volume and a difference in absolute value between the pressure in the first volume and the pressure in the second volume is more than a predetermined value more than zero, and prevents the liquid from flowing from the first volume into the second volume when the pressure in the first volume is not more than a total amount of the pressure in the second volume and the predetermined value.

10. A pump according to claim 1, wherein when the second plunger increases the second volume, the first plunger is capable of decreasing the first volume sufficiently for feeding the liquid from the first volume into the second volume.

11. A pump according to claim 10, wherein a difference between a difference between the increasing rate of the second volume increased by the second plunger and the decreasing rate of the volume of the first volume decreased by the first plunger and a predetermined degree is kept within an acceptable range.

12. A pump according to claim 10, wherein a decreasing rate in absolute value of the first volume decreased by the first plunger is more than an increasing rate in absolute value of the second volume increased by the second plunger, and the movement of at least one of the first and second plungers is controlled in such a manner that a difference between a difference in absolute value between an increasing rate of the second volume increased by the second plunger and a decreasing rate of the volume of the first volume decreased by the first plunger and a desired flow rate of the liquid to be discharged from the second volume to the outlet path for the chromatography is kept within a predetermined range.

13. A pump according to claim 1, wherein a change rate in absolute value of the first volume with respect

to a movement velocity in absolute value of the first plunger is larger than a change rate in absolute value of the second volume with respect to a movement velocity in absolute value of the second plunger.

14. A pump according to claim 1, wherein the first plunger is capable of being stationary at least temporarily when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography.

15. A pump according to claim 1, wherein the outlet path includes a drain valve openable to discharge a gas out of the outlet path through the drain valve to fill the outlet path with the liquid when the first plunger decreases the first volume, and closable to discharge the fluid from the second volume out of the pump through the outlet path for the chromatography when the second plunger decreases the second volume.

16. A pump according to claim 1, wherein a maximum change rate in absolute value of the first volume obtainable in accordance with the movement of the first plunger is larger than a maximum change rate in absolute value of the second volume obtainable in accordance with the movement of the second plunger, and a minimum change rate in absolute value of the first volume obtainable in accordance with the movement of the first plunger is smaller than the maximum change rate in absolute value of the second volume obtainable

in accordance with the movement of the second plunger.

17. A pump according to claim 1, wherein a movement velocity in absolute value of the second plunger for increasing the second volume is larger than a movement velocity in absolute value of the second plunger for decreasing the second volume to discharge the fluid from the second volume to the outlet path for the chromatography.

18. A pump according to claim 1, wherein the first plunger is capable of decreasing the first volume to increase a pressure in the first volume when the second plunger decreases the second volume.

19. A pump according to claim 1, wherein the first plunger is capable of decreasing the first volume to pressurize the fluid in the first volume to a pressure insufficient for feeding the liquid from the first volume into the second volume and not more than a desired pressure of the liquid to be discharged from the pump, when the second plunger decreases the second volume.

20. A method for controlling a pump for feeding a liquid for chromatography, including, first and second chambers, first and second plungers forming first and second volumes respectively together with the first and second chambers and being capable of reciprocating in the first and second chambers respectively in such a manner that the first and second volumes are variable in accordance with respective movements of the first

and second plungers, a communication path connecting fluidly the first and second volumes to each other, an inlet path communicating fluidly with the first volume, from which inlet path the liquid to be fed is capable of being supplied into the first volume, and an outlet path communicating fluidly with the second volume, by which outlet path the liquid to be fed is capable of being discharged from the second volume, comprising the steps of:

opening a drain valve in the outlet path to discharge a gas out of the outlet path through the drain valve so that the outlet path is filled with the liquid when the first plunger decreases the first volume,

closing the drain valve when the second plunger decreases the second volume to discharge the fluid from the second volume to the outlet path for the chromatography, and

controlling at least one of the movement of the first plunger for decreasing the first volume sufficiently for feeding the liquid from the first volume into the second volume and the movement of the second plunger for increasing the second volume in such a manner that a difference between a difference in absolute value between an increasing rate of the second volume increased by the second plunger and a decreasing rate of the volume of the first volume decreased by the first plunger and a desired flow rate of the liquid to

be discharged from the second volume to the outlet path for the chromatography is kept within a predetermined range.